U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO 24, CALIFORNIA

IN REPLY REFER TO FILE:
730-16
ALB:jp
28 FEB 1961

AIR MAIL

From: Commanding Officer and Director
To: U.S. Atomic Energy Commission (Division of Licensing and Regulation) Washington 25, D. C.
Via: Chief, Bureau of Ships (Code 362)

Subj: Application of Byproduct Material License Renewal; forwarding of

Encl: (1) Form AEC-313 w/7 supplements (3 copies)
(2) Conditions requested for NRDL Byproduct Material License (3 copies)

1. Encl. (1) is submitted for the renewal of the NRDL's Byproduct Material License #4-87-3. There are seven (7) supplements attached to the application which provide more detailed information.

2. Since some of the conditions of our present license are still appropriate, a review of these conditions and a request for changes are presented in encl. (2). In summary, the following conditions are still considered appropriate: Conditions 11, 12, 13, 14, 15, 16, 18, 19, 21 and 22. Changes or deletions are requested for Conditions 20, 23, 24 and 25. Two new conditions are requested in connection with dose amortization and exposure to aerosols.

3. We shall be pleased to supply any additional information you may require in connection with this application.

E. B. ROTH

Copy to: (w/encls. (1) & (2))
BuMed (Code 74)
AEC, SFOO (Compliance Division)

32961

Form AEC-313 (5-48)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R027.4

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U. S. Atomic Energy Commission, Washington 25, D. C. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

U.S. Naval Radiological Defense Laboratory
San Francisco 24, California

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

As approved by the USNRDL Radioisotope Committee

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Any

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

Renewal of 4-487-3 w/amendments 2, 3 and 4
associated licenses: 4-487-1 to 4-487-7

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

As approved by the USNRDL Radioisotope Committee

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

A. L. Baletti
Chairman, Radioisotope Committee
Head, Health Physics Division

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

Any Byproduct Material between Atom No. 3 and No. 84 inclusive, and Hydrogen 3

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

5.0 curies of each Byproduct Material from Atom No. 3 to No. 84 inclusive, except the following:

(See Supplement 1)

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

Research and Development

(See Supplement 2)

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(Continued on reverse side)

Encl. (1)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	(See Supplement 3)		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		(See Supplement 3)		

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS *(Include make and model number of each)*	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE *(mr/hr)*	WINDOW THICKNESS *(mg/cm²)*	USE *(Monitoring, surveying, measuring)*
(See Supplement 4)					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE. Instruments are calibrated monthly with cobalt 60 and cesium-137 which were certified by NBS or measured by NBS certified thimble chambers.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

(See Supplement 5)

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* Yes No (See Supplement 6)

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source. (See Supplement 7)

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. [illegible] Nuclear Engineering Co. and will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. Ocean Transport Co.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

A. [illegible] BALETTI
Chairman, Radioisotope Committee
Applicant named in item 1

Date _____ By: _____

Title of certifying official

RECEIVED MAR 6 1961 U.S.A.E.C. Publications Branch

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948, 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

GPO - 87 407 3

Supplement 1 (Item 6B)

Possession Limits

Radioisotope	Required Possession (curies)
Barium 140	1,000
Bromine 82	50
Cesium 137	1,000
Cobalt 60	15,000
Hydrogen 3	200
Iridium 192	500
Lanthanum 140	1,000
Lutecium 177	2,000
Mercury 203	10
Strontium 90	100
Xenon 133	2,000
Special irradiations of NRDL's source and special nuclear material (mixed fission products)	100

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Supplement 2 (Item 7)

Statement of Use

Research and Development as defined in Section II(q), Atomic Energy Act of 1954.

(1) Theoretical analysis, exploration or experimentation, or (2) the extension of the investigative findings and theories of a scientific or technical nature into practical application for experimental and decontamination purposes, including experimental production and testing of models, devices, equipment, materials and processes.

Byproduct material obtained pursuant to this application will not be used as follows: (a) in human beings, (b) in routine industrial use or commercial re-sale, (c) in fields where control of radioactivity might be lost. All uses will be approved in advance by the Radioisotope Committee of the USNRDL, and the Committee Chairman will maintain a record of the action taken in approving each use.

Supplement 3 (Item 8)

Radioisotope Committee Members and Qualifications

Albert L. Baietti

Chairman, Radioisotope Committee, NRDL, 1951 to date; Head, Health Physics Division, NRDL, March 1953 to date; Head, Radiological Safety Branch, NRDL, 1951-1953; Radiological Physicist, 1951 - Assistant Head, Health Physics Branch, NRDL; Health Physicist, ORNL - 1 year; Vacuum Engineer, Carbide and Carbon Chemical Corp., Oak Ridge, Tenn. - 8 months; Physicist, Tennessee Eastman Corp., Oak Ridge - 5 months; Physicist, Kellex Corp., New York - 2½ years; Senior Engineer, Jackson and Moreland Company, Boston, Mass - 2 months.

Dr. Eugene P. Cooper, Alternate Chairman

Scientific Director, NRDL, July 1960 to present; Associate Scientific Director, NRDL, March 1953 to July 1960; Head, Special Operations Division, NRDL, October 1951 to 1953; Physicist, U.S. Naval Ordnance Test Station, Underwater Ordnance Dept., Pasadena, Calif. - 3 years; Associate Professor of Physics, University of Oregon, Eugene, Oregon - 1 year; Head, Aircraft Fire Control Station, Naval Ordnance Test Station, Inyokern, Calif. - 21 months; Research Physicist, Franklin Institute, Philadelphia, Pa. - 2½ years; Associate Professor of Physics, University of North Carolina, Chapel Hill, N.C. - 2 years.

Dr. Edward L. Alpen

Head, Biological and Medical Sciences Division, NRDL, April 1959 to present; Head, Biophysics Branch, NRDL, 1956 - April 1959; Head, Thermal Injury Branch, NRDL, 1952 - 1956; Research Investigator in Thermal Injury Branch, NRDL, April 1951 - September 1952; Assistant Professor of Pharmacology, George Washington University, Washington, D.C., January 1950 - April 1951.

Dr. C. Sharp Cook

Head, Nucleonics Division, NRDL, April 1960 to present; Head, Radiation Characteristics and Effects Branch, NRDL, 1959 to 1960; Head, Nuclear Radiation Branch, NRDL, 1953 - 1959; Assistant Professor of Physics, Washington University, St. Louis, Mo., 1948 to 1953; Research Assistant, Indiana University, 1946 to 1948; Teaching Assistant, Indiana University, 1940 to 1942.

Dr. Lewis H. Gevantman

Head, Chemical Technology Division, January 1961 to present; Head, Radiation Chemistry Branch, NRDL, November 1959 - January 1961; Head, Radiation Chemistry Group, NRDL, 5 years; Radiological Chemist, NRDL - 4 years; Associate Chemist, Clinton Labs., Oak Ridge, 3½ years.

Supplement 4 (Item 10)

Instruments	Type	Quantity on Hand	Window Thickness and Range	Purpose
Berkeley 2750 (Beckman Instr. Co.)	Side window G-M	27	30 mg/cm^2 0-50,000 c/m	β-γ contamination monitoring
Eberline E112B	Side window G-M	7	30 mg/cm^2 0-20 mr/hr	β-γ contamination monitoring
Nuclear 1615B	End window G-M	3	3.5 mg/cm^2 0-50,000 c/m	β-γ contamination monitoring
AN/PDR-27	End window G-M Enclosed G-m	98	3.5 mg/cm^2 0-5 mr/hr 1300 mg/cm^2 0-500 mr/hr	β-γ contamination monitoring and dose rate monitoring
El-Tronics CP3D (Cutie-Pie)	Ionization Chamber	48	100 mg/cm^2 0-10 rad/hr	β-γ dose rate monitoring
AN/PDR-T1B	Ionization Chamber	46	1800 mg/cm^2 0-50 r/hr	γ dose rate monitoring
Kelcket, AN/PDR-3	Five-fold (G-M)	2	30 mg/cm^2 10^4 counts	β-γ hand and foot counter
Austin, Model 4	Five-fold (G-M)	2	30 mg/cm^2 10^4 counts	β-γ hand and foot counter
NRDL Tritium Meter	Gas Chamber	1	10^{-3} μc/cc sensitivity	Tritium air contamination monitoring

Supplement 4 (Item 10 (Cont'd)

Instruments	Type	Quantity on Hand	Window Thickness and Range	Purpose
T-289 Tritium Detector	Ionization Chamber	2	10^{-5} μc/cc sensitivity	Tritium air contamination monitoring
T-290 Tritium Detector	Ionization Chamber	2	10^{-3} μc/cc sensitivity	Tritium air contamination monitoring.
Eberline PAC3G	Proportional Chamber Probe	2	1.5 mg/cm^2 0-100,000 c/m	alpha contamination monitoring
AN/PDR-10	Air Proportional	2	1.5 mg/cm^2 0-10,000 c/m	alpha contamination monitoring
Nuclear Model 2111 (Pee Wee)	BF_3 proportional probe	4	10^2 n/cm^2/sec fast 10^3 n/cm^2/sec slow	neutron dose rate monitoring
AN/UDR-9 sealer w/scintillation counter	Scintillation counter	2	5 mg/cm^2 10^6 c/m	β air, water and wipe sample counting
IDL Scaler, Model 164 w/GE scintillation counter	Scintillation counter	1		Alpha air, water and wipe sample counting
Berkeley Decimal Scaler w/side window G-M	GM Counter	1	30 mg/cm^2	β-γ air sample counting
Berkeley Decimal Scaler w/end window G-M	GM Counter	1	5 mg/cm^2	β-γ air and water sample counting

Supplement 4 (Item 10) Cont'd

Instruments	Type	Quantity on Hand	Window Thickness and Range	Purpose
Nuclear Meas. Corp. Model DS-1 Scaler w/end window GM	G-M Counter	1	5 mg/cm^2	β-γ air and water sample counting
Dosimeter IM 50A/PD	Direct reading pocket chamber	7	0-200 mr	γ personnel dosimetry
Dosimeter, Landsverk Dosimeter, Bendix	Direct reading pocket chamber. Direct reading pocket chamber.	10	0-5 r 0-1 r	γ personnel dosimetry and personnel dosimetry
Dosimeter Keleket K-300 (IM 12/Pd)	Pocket Chamber	12	*	Neutron personnel dosimetry
Dosimeter, Bendix	Direct reading pocket chamber	50	0-5 r	γ personnel dosimetry
Film Badge	DuPont 510 and 555; 4 filter film holder	1000	50 mr to 100 r	β-γ personnel dosimetry
Film Badge	NTA film	65	10-10,000 mrad	Fast neutron personnel dosimetry
Nuclear Chicago AN/PDR-49A	BF_3 Probe	1	2.5x10^4 n/cm^2/sec slow or fast	Neutron dose rate monitoring
Nuclear Corp. of America PDR/47A	Proton-recoil proportional counter	1	0-500 mrep/hr fast	Fast neutron dose rate monitoring
Staplex, High Volume	Air Sampler	16	40 CFM	alpha, β-γ aerosol sample collection

* Full scale represents 2 time daily MPE for thermal neutrons. MPE for thermal neutron is taken to be 1500 n/cm^2/sec.

Supplement 5 (Item 12)

Personnel Monitoring Devices and Procedures

The standard film dosimeter used at NRDL is the four-filter badge that uses filters of thicknesses 0.040" aluminum, 0.027" lead, 0.015" cadmium, and 0.010 paper film covering. It can be calibrated so as to give effective energy information as well as dosage information. The film used is a two-film packet, containing DuPont 510 and 555 film, and can measure gamma exposures from 50 mr to 100 r. The DuPont 510 and 555 films are calibrated for response to beta radiation with a normal uranium plaque, and for response to gamma radiation with a NBS-certified radium source, cesium-137 source, cobalt-60 source, and various energies of X ray, using NBS-certified thimble chambers as a standard. All calibration exposures are done with the film inside the badge.

Neutron film badges (NTA film) are also used when neutron sources are handled, or when personnel are in proximity to nuclear reactors or neutron producing particle accelerators. A commercial neutron badge service is utilized (Radiation Detection Company, Palo Alto, California).

Pocket dosimeters used at the Laboratory include the IM9/PD and IM50/PD, 0-200 mr, the Lansverk and Bendix, 0-5 r, all self-reading devices. Keleket K-300 slow-neutron pocket chambers are also available.

Film badges are issued to all Laboratory personnel and to all Laboratory visitors who enter radiation areas. Films are processed regularly on a monthly basis and the integrated dosage for the period is entered on personnel exposure records. Special film processing is done for cases of suspected individual excessive exposure, or in cases of high pocket-dosimeter readings. Individual beta, gamma and X-ray dosage entries are made, as well as neutron dosages when these occur. Radiation history records are established for all NRDL employees.

Pocket dosimeters are issued, on a case basis, to personnel working on experiments or entering areas where it is possible to exceed the daily permissible exposure.

Two general types of radio-urinalysis bio-assay procedures are followed at USNRDL: (1) for routine analysis or when the suspected ingested radioactive material is not identified, gross radioactivity measurements are made. The urine sample is flocculated with $Ca\ CO_3$ solution, the precipitate is ashed and the residue is counted for beta activity, using appropriate self-absorption corrections. A K-40 correction is not made, since potassium is not precipitated with $Ca\ CO_3$; (2) in cases where the suspected ingested material has been identified, a chemical separation procedure appropriate for that particular element or group of elements is used. Among the specific analysis procedures that have been performed at the Laboratory are those for Pu-239, radium, Cs-137, Ba-140, La-140, uranium, Rb-86, In-114, Sr-90, polonium, tritium, and the lanthanide series.

Supplement 6 (Item 13)

Facilities and Equipment

Byproduct material use, handling and storage equipment available at NRDL includes the following:

1. Twelve shipping containers, lead-shielding thickness ranging from 2" to 11".
2. 100 storage containers, 1" lead.
3. 32 storage containers, 2" lead.
4. 28 storage containers, 3" lead.
5. One concrete-shielded storage vault for isotope storage containers.
6. One concrete-shielded storage vault for radiation sources.
7. Two fenced-storage areas for contaminated equipment.
8. Twenty remote pipettes for isotope solution transfers.
9. Two sets of master-slave manipulators.
10. Two concrete-walled hot cells.
11. Four lead-shielded glove boxes.
12. Twelve glove boxes, unshielded.
13. Miscellaneous remote-handling tongs.
14. Sixteen radiobiological laboratories with 43 fume hoods.
15. Twenty-three radiochemical laboratories with 43 fume hoods.
16. Three radiophysics laboratories with 3 fume hoods.
17. One mobile radiological safety protective equipment supply station

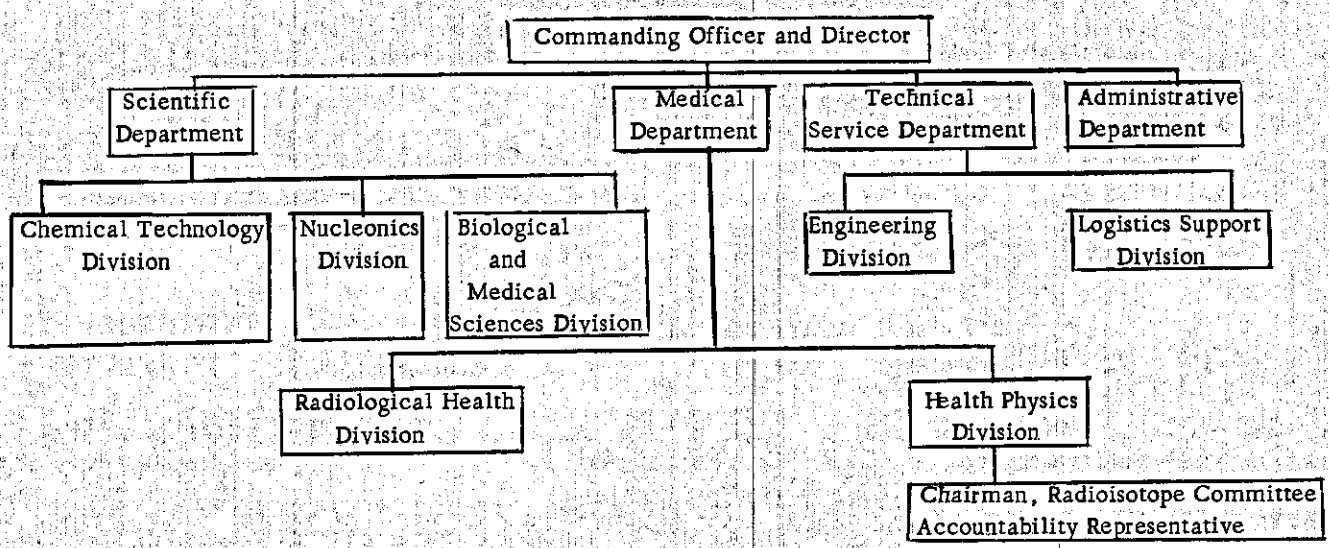
Supplement 7 (Item 14)

Accountability and Health Physics Measures for Radioactive Material at NRDL

I. Introduction

The U.S. Naval Radiological Defense Laboratory is a laboratory engaged in basic and applied research on the physical and biological effects of nuclear and thermal radiation, with particular emphasis upon those factors relating to the requirements of the military services.

The Health Physics Division of the Laboratory is responsible for the protection of Laboratory personnel and the environment from radiological hazards. The following chart shows the organizational relationship of the Health Physics Division to the rest of the Laboratory:



The responsibilities of the Health Physics Division include the control and accountability of all radioisotopes including source and special nuclear material, used in the Laboratory. To accomplish these responsibilities the Head, Health Physics Division, serves as the Accountability Representative and as the Chairman, Radioisotope Committee.

The control procedures detailed below are those used for all byproduct material and other material defined as "accountable material" by the USAEC.

2. Ordering Radioactive Material

All requests to use radioactive material in Laboratory experimental programs are submitted to the Health Physics Division and describe in detail all the proposed conditions under which the materials will be used. All such requests are carefully evaluated by the Health Physics Division for possible radiological hazards. On the basis of the evaluation, it may be necessary to change experimental procedures so as to eliminate or to minimize radiological hazards. Each request is then reviewed by the Radioisotope Committee, which consists of senior members of the Laboratory staff. Upon approval by the Radioisotope Committee, an order for the material is processed by the Logistics Support Division.

3. Receipts

All shipments of radioactive material are delivered, unopened, to the Health Physics Division. Health Physicists, or technical personnel under their supervision, open the package, conduct the necessary radiological surveys, perform any necessary decontamination, and determine, by appropriate method, the activity content of the material. A record is made which shows the identity of the material, quantity, amount of activity, storage location, and use to which it is put. This record is maintained as long as the material is at the NRDL. The Chairman, Radioisotope Committee, is supplied with all necessary data to maintain these records.

4. Storage

All radioactive material is stored, when not in experimental use, in a subterranean storage vault in the isotope storage room. This room has walls of 36" thick reinforced concrete and a door equipped with a key opening lock, The storage vault consists of 40 stainless steel cylinders holding four (4) lead storage containers each. These lead containers are divided into three effective shielding thicknesses (1", 2", and 3"). The containers are removed from the storage vault by a remotely-controlled traveling crane of 3 tons capacity.

5. Experimental Use

Quantities of radioactive material are issued, as needed, for experimental use. Detailed records are maintained by the Chairman, Radioisotope Committee of the quantity issued and its location in the Laboratory. Periodic monitoring surveys are made in each laboratory space in which radioactive material is used. Special monitoring surveys are made, as needed, when the experimental use so indicates.

6. Shipping

All shipments of radioactive material leaving the Laboratory are checked by the Health Physics Division to assure ICC shipping requirements are met and that the proper shipping form is prepared and transmitted.

7. General Health and Radiological Safety Measures

The Health Physics Division of the Laboratory is responsible for providing adequate radiological safety measures for all Laboratory personnel working in all Laboratory spaces where radioactive material is handled, and special monitoring services where any experimental or maintenance operation involves an unusual radiological hazard. A personnel monitoring program provides film badges for all Laboratory personnel, pocket dosimeters for personnel engaged in certain experiments, and appropriate radioclinical examination for internal contamination for those personnel working with loose or unconfined radioactive materials. A supply of calibrated monitoring instrumentation, adequate to measure all types of radiations encountered, is maintained by the Health Physics Division for health physics and self-monitoring purposes. An active air sampling program guards against buildup of hazardous airborne concentrations of radioactive materials. All NRDL liquid effluent (except sanitary drains) is held up in storage tanks and analyzed to insure that the radioactivity concentration is below the maximum permissible concentration prior to release to the sewer system.

The Radiological Health Division of the Laboratory performs physical examinations, including radio-urinalysis, for all personnel entering or leaving the employ of the Laboratory, and additional examinations during employment as required by the nature of the work.

8. Records

Radioactive material records are maintained utilizing a file which contains all pertinent data relative to location, quantity, physical form, and use of the material.

Individual use-approval forms, called NRDL Form 44 and 44A (copies attached) are initiated by each experimenter when a particular radioactive material is required. The experimental plan is reviewed by the Radioisotope Committee who has supervisional cognizance over the experimental program. When the request for radioactive material is approved by the Radioisotope Committeeman, the completed form is submitted for review to the Health Physics Division. The Health Physics Division investigates the request and recommends radiological safety requirements imposed by the particular experimental setup. (See attached Form 76, Isotope Procurement Investigation). The completed Form 76 is then submitted with the individual program plan to the Chairman of the Radioisotope Committee for review and final approval. A purchase order and procurement of the radioisotope is processed, only after this final approval is granted.

RADIOISOTOPE USE APPROVAL
12ND NRDL-44 (Rev. 10/58)

1. Prepare original and 2 complete copies, including sketches, drawings, etc., if any.
2. Forward all 3 copies to Division Radioisotope Committeeman for signature.
3. After Division Radioisotope Committeeman's signature forward all 3 copies to Radiological Safety Branch, Code 732.
4. Use form NRDL-44A for variations from previously approved form 12ND NRDL-44.

To
Chairman, Radioisotope Committee, Code 730

Via	Signature	Date
(1) Division Radioisotope Committeeman, Code		
(2) Radiological Safety Branch, Code 732		

It is requested that approval of the use of the following isotope be granted.

Element and Isotope	Chemical Form	Pile Irradiation or Cyclotron Bombardment Services Required
Quantity (mc or units)	Date Required	User (Name and code)
Location of Use (Bldg., room No., other)		Zone Level (Check) ☐ 2 ☐ 3 ☐ 4
Waste Concentrations and Amounts Liquid Solid		Estimated Activity Per Experimental Run

Experiment (Title or brief description)

Proposed Procedure (Attach sketch or description of apparatus)

Submitted By	Code	Date

Approved for use as requested.

Signature of Chairman, Radioisotope Committee	Date

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Distribution of completed copies:
Division Radioisotope Committeeman, Code ____ Code 730 Code 732

MODIFICATION OF RADIOISOTOPE USE APPROVAL
12ND NDRL-44A (Rev. 11/59)

1. Use only when modifying original request, Form 12ND NRDL-44
2. Prepare original and 2 copies, including sketches, drawings, etc., if any.
3. After the Branch Head has signed forward all 3 copies to the Radiological Safety Branch, Code 732.

From (Branch Head)	Stub No. Reference	Date

To	Via
Chairman, Radioisotope Committee, Code 730	Radiological Safety Br., Code 732

Remarks

Signature of Branch Head	Signature of Chairman, Radioisotope Committee

ISOTOPE PROCUREMENT I STIGATION
12ND NRDL-76 (Rev 9/59)

Adequate Safety Precautions Being Taken in Experiment

☐ Yes ☐ No

Special Equipment Requirements

Comments

Signature of Senior Investigator	Date
Reviewed by Branch Head	Date

Conditions Requested for NRDL Byproduct Material License

1. Conditions 11 and 14 are considered essential to the present experimental program of the NRDL. Therefore, in accordance with information already on file with the Division of Licensing and Regulation, it is requested that they again be included as follows:

   a. "Byproduct materials may also be used at Navy, Army, and Air Force facilities provided such use is under the direct supervision and control of U.S. Naval Radiological Defense Laboratory personnel and in accordance with the procedures established by the Radioisotope Committee of the U.S. Naval Radiological Defense Laboratory."

   b. "Byproduct material as sealed sources shall not be opened. The term "sealed sources" shall not include byproduct materials sealed in containers for irradiation and transit purposes."

2. It is requested that Condition 20 be deleted, or if that be not considered wise, then the wording clarified to permit the intentional controlled dispersion of radioactive material as necessary to discover and measure the hazard it produces in structures and environment, to estimate the efficacy of techniques for decontamination, and for other studies involving the controlled release of radioactivity into the environment.

3. It is requested that Condition 23 be modified as follows: Delete the present wording and state that all individuals using or having responsibility for use of byproduct material shall be given guidance and have available written instructions concerning radiological protection, control and security of byproduct material.

   This is currently done by NRDL Management Instructions which are periodically reviewed and revised in accordance with 10CFR20 and other pertinent directives promulgated by BuShips, BuMed and the USAEC.

4. It is requested that Condition 24 be deleted inasmuch as the recent changes in 10CFR20, effective 1 January 1961 now provide for this condition.

5. It is requested that reference to specific nuclides be eliminated from Condition 25, so that the amended wording will be somewhat as follows:

   "In accordance with Sect. 20.302, byproduct materials with half-lives of 3 months or less may be disposed of by storage and decay in roped off and posted restricted areas."

6. It is noted that the most recent edition of 10CFR20 makes no statement with regards to dose amortization. It is requested that the following condition be made a part of the NRDL license.

> "In the event of an emergency or accident that results in exposure in excess of 3.0 rem in a calendar quarter, that person's activities will be limited so that the exposure in that quarter plus the exposure in the following quarter will not exceed 6.0 rem. Exposure during subsequent calendar years will be determined by the MPD, (N-18) x 5 rem."

7. In accordance with Sect. 20.103 of 10CFR20, it is requested that a condition be established in the NRDL license that will permit the exposure of personnel to aerosols, when they are provided with the respiratory equipment described in Appendices A and B.

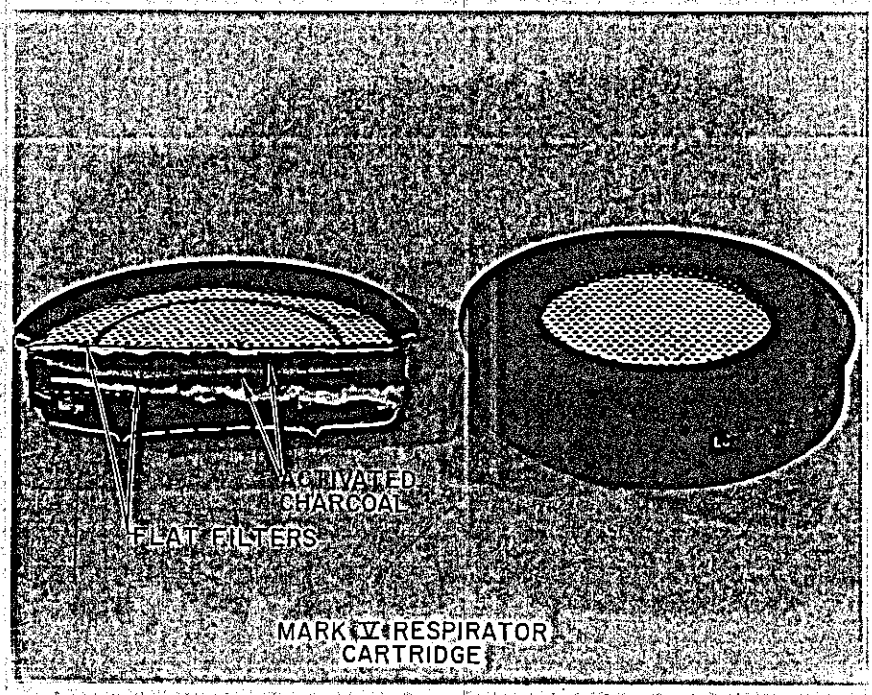
Some of NRDL projects require simulation of radioactive fallout on buildings, fields, etc. The simulant is in graded particle sizes (ranging from 44 μ to 700 μ, with no more than 5% by weight less than 44 μ)with varying chemical properties and radioactive labelling (usually short-lived). It is dispersed outdoors, subject to weathering, or indoors for more fundamental study of techniques and hazards and success of reclamation.

During both lay-down and recovery operations outdoors, the atmosphere is continuously sampled using Staplex air samplers with 1106 B type filters (made by MSA). Full-face masks (see Appendix A) are worn (or exposure time limited) except when the measurements continue to show that the aerosol hazard is negligible.

For experiments conducted inside buildings, a confined space, with auxiliary ventilations, is used. Continuous air sampling is carried out in the immediate area and the periphery (including outside the building). The measuring equipment is listed in Supplement #4 of the License Application in encl. (1). We plan to augment this with continuous air sampling units with a direct read-out system. Normally nobody has to enter the test area during the existence of the aerosol. If any person must go in, he will wear a supplied-air suit (see Appendix B) or a full-face mask (see Appendix A) according to whether the aerosol concentration measures above or below 1000 times the MPC listed in Appendix B, Table 1 of 10CFR20.

A. L. BAETTI
Chairman, Radioisotope Committee

MARK V RESPIRATOR



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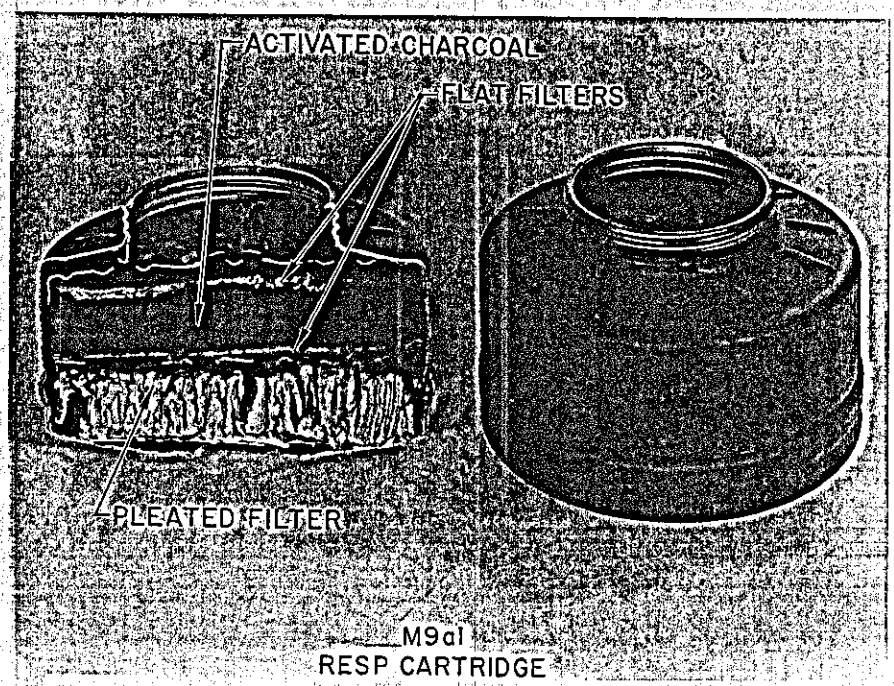
M9A1 RESPIRATOR



M9a1
RESP CARTRIDGE

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APPENDIX B

Respiratory Protection - AIR SUPPLIED SUITS

Snyder (Snyder Mfg. Co., New Philadelphia, Ohio) one-piece protective suit, #2P, .020 gauge vinyl, air supply of 5/16" I.D. vinyl tubing with copper fittings. Air is exhausted from garment through five diaphragm flutter-type valves spaced in various positions. Two (2) such suits are on order.

Air requirements for suit wearing is 3-5 lbs/in^2 pressure with a flow rate of approximately one cubic foot per minute.

An air compresor (a Sutor-Bilt rotary air blower, 10 cfm, model 185V, delivering 15 lb/in^2 pressure) will be used for air supply. A charcoal-particulate gas mask canister will be placed between the air supply and the suit to remove pump-oil vapors.

Manufacturer's descriptive literature of the suit is attached.

PROTECTIVE SUITS

Comfortable, high quality, protective suits to shield the operator from dangerous and toxic gases, fumes and radioactive particles. Fabricated in one piece or two piece construction with all seams electronically sealed. These suits have been designed as general purpose garments, generously proportioned to a universal size and constructed to be both practical and basic. From this design we can adapt or change the garment to meet your specific application.

All of our suits provide a built-in air supply distribution system.

In applications, when a plant air supply is not available, we have redesigned suits, enabling the operator to carry a portable, cannister type air supply unit, either inside or outside the garment.

In applications, when the exhaust from the garment should not contaminate the atmosphere, a second air line is introduced for ejection of air.

If polyvinyl chloride, used to fabricate our garments, is not applicable to your operation, many other materials are available which may fit your needs.

ONE-PIECE SUITS

#1P .012 gauge vinyl

#2P .020 gauge vinyl

#3P Reinforced nylon-vinyl, 12 ounce

One-Piece suits have a rear entry, double zipper, starting from the hood top and extending to the lower back. This opening is protected with a sturdy metal zipper on the inside and a heavy gauge, water-proof, smooth vinyl zipper on the exposed side.

The Face Piece, which is fabricated from .020 gauge pressed polished vinyl, provides complete visibility in all directions.

Boots of scuff resistant .090 gauge sheeting are permanently sealed to the body of the garment, with tie tapes provided for a comfortable fit. The waist is equipped with strong reinforced belt loops in event the operator must wear additional equipment.

ONE PIECE SUIT

PROTECTIVE SUITS (Cont.)

Neoprene gloves, which can be quickly and easily replaced, are attached to rigid cuffs which are permanent parts of the suit.

Air supply distribution system consists of 5/16" I.D. vinyl tubing and copper fittings. Air is channeled across shoulders to each wrist, down the legs to ankles and over head to the face piece, keeping view area fog free. About three feet of tubing extends out back of the garment, waist high, for attaching air supply. Air is exhausted from garment through five diaphragm flutter type valves spaced in various positions.

TWO-PIECE SUITS

#4P .006 gauge vinyl

#4P-12 .012 gauge vinyl

#4PR Reinforced nylon vinyl, 12 ounce

Two-piece suits consist of a hooded Slip-over jacket and trousers, both of which are secured at the waist by draw strings.

Supressor straps are sealed to jacket and trousers to prevent garment from separating during use.

Permanent boots are fabricated from .020 gauge sheeting, sealed to the garment. The operator may wear an additional pair of shoe covers over the boots for extended use.

The Face Piece and glove attachment are identical to one-piece construction.

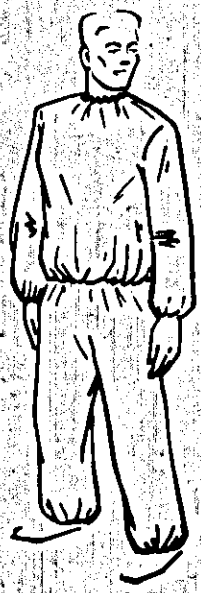
The air circulation system is identical to the one-piece with this exception; only one source of air is provided to the trousers and the air is exhausted out of the suits at the waist area.

ACID SUIT

#32P .004 gauge vinyl

An inexpensive slip-over jacket and trousers. All seams are bound, with elastic sewn to the neck, cuffs and waist. Available in sizes small, medium and large. No air supply system is provided with this garment.

TWO PIECE SUIT



#32P ACID SUIT